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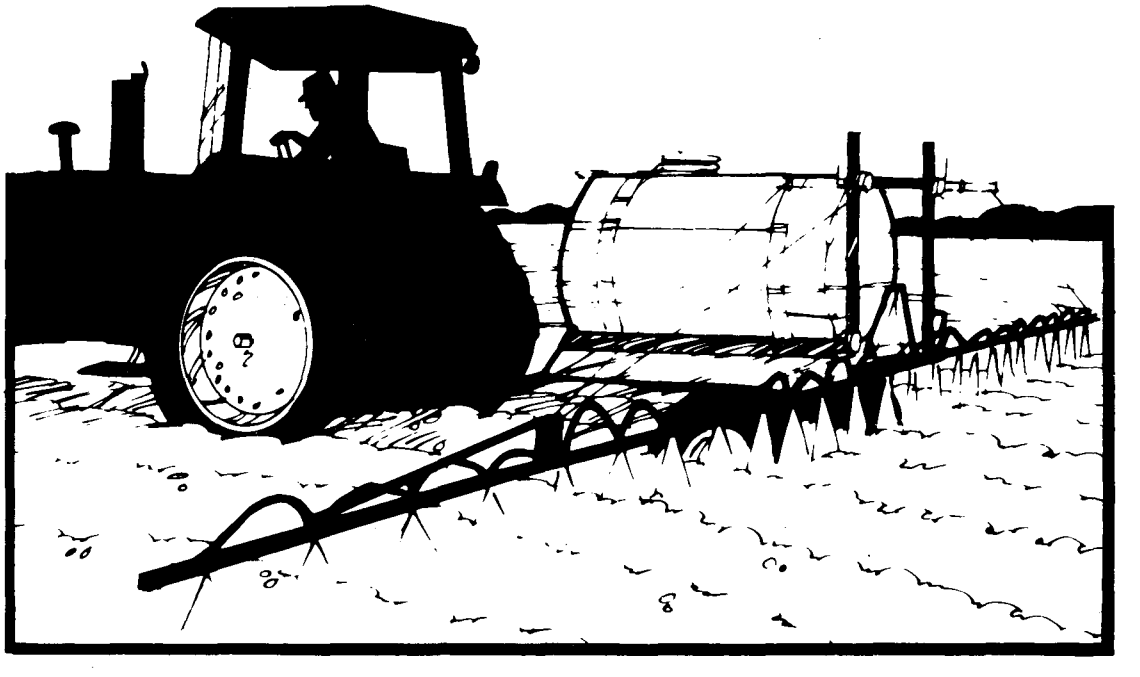
Safe Use of Pesticides on the Farm



Robert A. Aherin
Lee Schultz
Richard Meronuck

Introduction

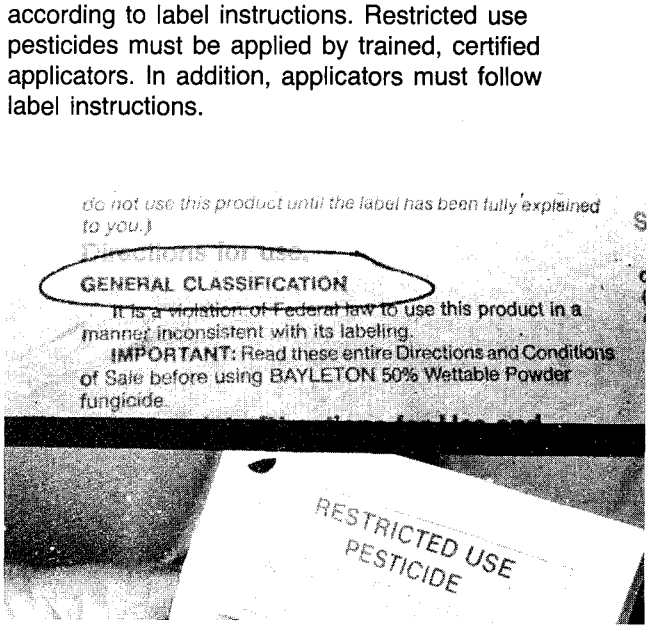
The increased use of pesticides in agriculture has greatly improved farm productivity. However, this growing reliance on pesticides raises the risk of potentially serious health problems in farm workers if pesticides are not used according to label instructions.

Pesticides are chemical mixtures used to control specific pests. The major pesticide groups are insecticides, rodenticides, herbicides, and fungicides. All are potentially hazardous to humans and non-target organisms if used improperly. Pesticides come in different forms, such as wettable powders, granules, emulsible concentrates, and gases. This diversity makes the safe and effective use of pesticides still more complex.

A wide variety of pesticide accidents have been reported to our state department of agriculture over the past six years. They included accidents resulting from equipment malfunction, tank and container leaks, vehicle accidents, lack of respirators, back siphoning, aerial crashes, aerial and ground drift, unlabeled containers, and lack of posted entry notices.

There are approximately 40,000 pesticide formulations available in the United States; 7,000 of these are registered in our state.

The toxicity and hazards of pesticides varies over a wide range. Federal and state government agencies require each pesticide to be registered and classified for either general or restricted use. Pesticides classified for general use will cause little or no environmental damage when used according to label instructions. Restricted use pesticides must be applied by trained, certified applicators. In addition, applicators must follow label instructions.

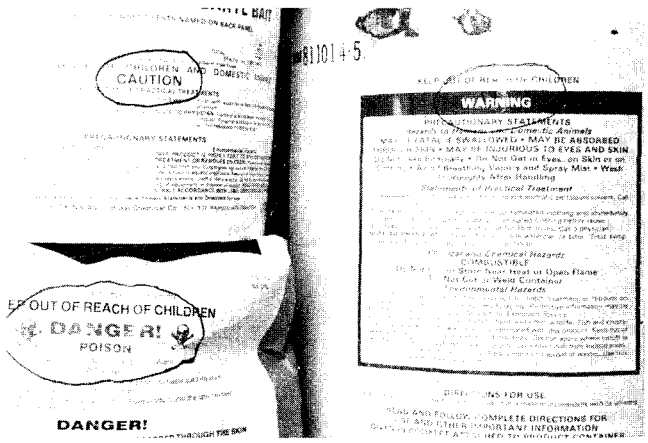


Pesticides must be registered and classified for either general or restricted use.

Effects of Pesticide Exposure

Because pesticides are poisonous, it is important to understand the hazards of pesticide exposure. The effect of pesticide exposure on a person depends on the toxicity of the product, the amount of exposure, and the mode of entry into the body. Major adverse effects on human health include acute systemic poisonings; skin, eye, and nose irritation; dermal sensitization; and pulmonary injury.

The degree of toxicity of a pesticide is indicated by one of three signal words on the container label. They are: "Danger— poison", printed in red with a skull and crossbones symbol, denoting high toxicity; "warning", denoting moderate toxicity; and "caution" meaning relatively low toxicity.



Signal words on the container label indicate the degree of toxicity of a pesticide. Danger—poison (high toxicity); warning (moderate toxicity) and caution (relatively low toxicity).

LD or lethal dose value is another term often used in describing pesticide toxicity. For example, LD/50 means the amount of active ingredient in the pesticide formulation taken orally or injected into the skin that would be lethal to 50 percent of test animals. The LD amount is expressed in milligrams of toxic product per kilogram of body weight.

Insecticides are considered the most toxic of agricultural pesticides. Because there are metabolic similarities between insect and higher animals, insecticides are equally toxic to humans.

Organophosphates and carbamates, two major families of the insecticide group, are cholinesterase-inhibiting insecticides. That is, they interfere with the cholinesterase enzymes that control nerve impulse transmissions. Symptoms of this type of poisoning are sweating, nausea, vomiting, diarrhea, salivation, and pains in the chest and abdomen. Workers who are commonly

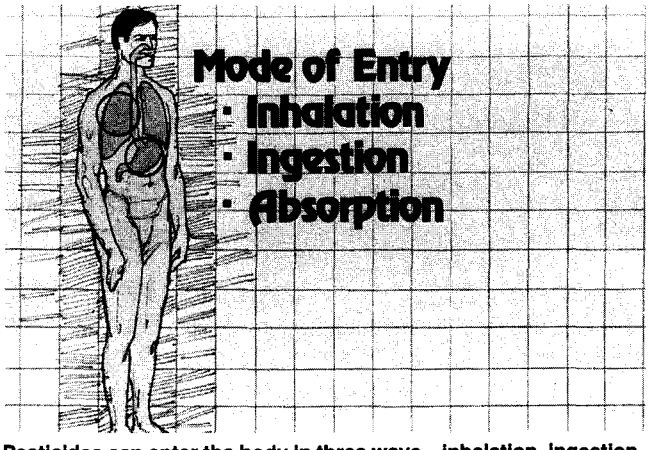
exposed to organophosphates and carbamate insecticides should have their baseline cholinesterase levels measured, using blood and urine tests, before the spraying season begins. Thereafter, a physician should monitor their cholinesterase levels regularly to document overexposure and possible poisoning.

Exposure to herbicides produces a wide range of symptoms, such as dermatitis and liver damage. If you suspect herbicide overexposure, contact your physician immediately for proper medical treatment.

Certain fungicides and rodenticides can adversely affect virtually all human tissue and organs. However, poisonings are fewer primarily because they are used less frequently than other major groups of pesticides. Follow the directions on the container label of fungicides and rodenticides to avoid unnecessary exposure.

Entrance into the Body

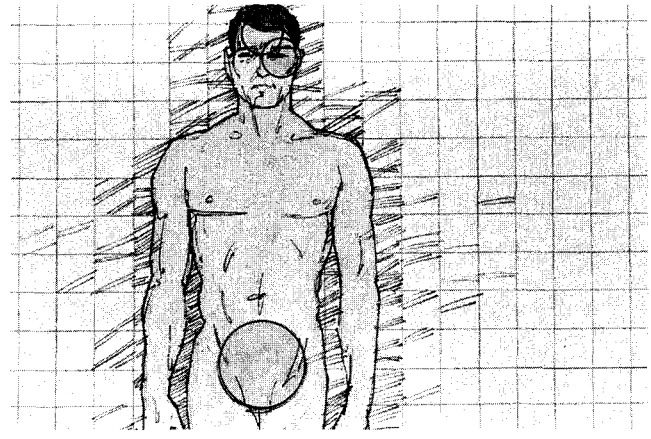
There are three ways for pesticides to enter the body—inhalation, ingestion, and skin or eye absorption. Of these three, inhalation is considered the most toxic. Inhaled particles are absorbed rapidly into the circulatory system because only thin membranes separate the air in the lungs from the circulatory system. Pesticide inhalation can be avoided by wearing a chemical respirator containing the proper cartridge or canister, by avoiding drift and by avoiding smoke from burning pesticide containers, and by not smoking pesticide-contaminated cigarettes.



Pesticides can enter the body in three ways—inhalation, ingestion, and skin or eye absorption.

While inhalation is the most toxic way for pesticides to enter the body, most incidents of acute poisoning occur through ingestion. Ingested pesticides are absorbed more slowly and less completely than inhaled pesticides because the membranes of the digestive tract are thicker. Thus, some of the toxicant passes through the body without being absorbed. Ingestion is generally the result of carelessness. Applicators can avoid oral exposure by establishing good work habits, including washing hands before eating, and not smoking, eating, or drinking when working with pesticides. Keep pesticides in the original container with the label intact; never store pesticides in any other container, especially containers that originally held food.

Pesticides can also enter the body by absorption through the skin and eyes. Applicators say absorption is one of the most common methods of accidental poisoning. The eyes, groin area, and forehead are the most absorbent areas of the body; the extremities are the least absorbent. Applicators can avoid absorption of pesticides through skin by wearing appropriate protective clothing and equipment. In case of a splash or spill, remove contaminated clothing immediately and wash the exposed area thoroughly with detergent and water.



Absorption is the most common method of accidental poisoning for applicators, with the eye, forehead, and groin areas the most absorbent areas of the body.

Personal Protective Equipment

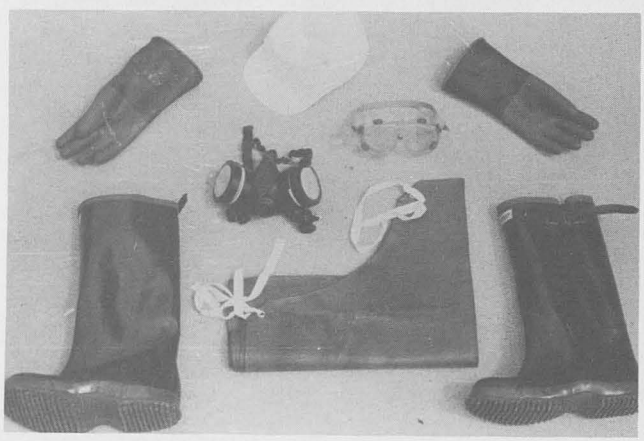
Personal protective equipment and clothing can protect you from unnecessary pesticide exposure. Protective equipment includes chemical respirators, goggles, or face shields. Protective clothing includes unlined rubber gloves and boots, long-sleeved shirts, trousers, aprons, and hard-shell hats with nonabsorbent headbands.

There is a chance that you will inhale dangerous amounts of toxic materials when working with pesticides, so it is important that you wear approved respiratory equipment. Follow instructions on the respiratory device and use a cartridge or canister filter, as specified. It is

essential that the respirator fits properly around your nose and mouth to give you adequate protection. Wear a chemical cartridge or canister-type respirator when blending or applying pesticides to filter harmful vapors, gases, and particulates from the air you inhale. However, a chemical respirator will not provide protection where there is insufficient oxygen, as in a silo or grain bin. Use a self-contained breathing apparatus in that situation.

Your respirator needs daily care to keep it effective. Change the chemical cartridge or canister filter each day during constant use and more often if breathing becomes difficult, if you detect the odor of pesticides, or if the cartridge or canister becomes excessively warm. Wash the face piece each day after use with a detergent solution to remove any harmful pesticide residue, rinse, dry, and store in a protected area.

Wear a face shield or vented chemical splash goggles when there is a risk of pesticide contact with your eyes. Clean the face shield and goggles daily with detergent and water. Do not wear contact lenses when working with pesticides because toxicants can get under lenses and permanently damage your vision.

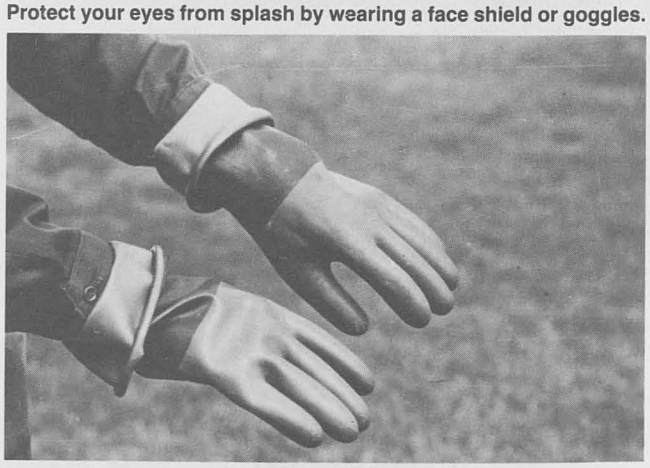


Personal protective equipment includes hard hat, goggles, chemical respirator, rubber gloves, apron and boots.

Wear a chemical respirator to avoid inhalation of dangerous toxic materials.

To avoid exposure and absorption of pesticides through the skin, wear protective clothing. Unlined, rubber, gauntlet-style gloves can be worn to protect the hands; when the upper end of the glove is folded down, your arms will be protected from pesticides when you raise your hands. Leather or lined gloves are not recommended because they are difficult to clean once contaminated. Long-sleeved shirts will further protect your arms.

Protect your eyes from splash by wearing a face shield or goggles.



Rubber gloves with an extra long cuff will protect the hands and when the upper end is folded down the arms will be protected when you raise your hands.

Other items of protective clothing recommended are unlined rubber boots, apron, and hat. Boots should be worn when spraying or dusting pesticides. Tie the pants down on the boots to reduce the chance of pesticides getting down inside the boots. Aprons, which are generally used in manufacturing operations, will protect your clothes from contamination. Wear rubber or neophrene aprons when working with pesticide concentrates because certain insecticides (especially organophosphates) can penetrate plastics. Hard-shell hats should be worn to protect the scalp and forehead. Hats should be made of a waterproof material with a nonabsorbent headband. Baseball-type caps should not be worn because they are porous and absorbent.

Wear clean clothes each day when you are working with pesticides and wash the clothing as soon as possible after use. If a dry form of pesticide was used, remove any powder or granules from the creases, pockets, or cuffs of the clothing before washing. Pre-soak the clothing in a tub or agitate in a washer and spin out. Wash contaminated clothes separately from other clothing. After washing clothes in hot water, run the empty machine through a complete cycle to remove any pesticide residue from the machine. Clothes contaminated with a liquid pesticide concentrate should be discarded as washing will not make them safe.

Wash pesticide-contaminated clothes separately from other clothing.

When purchasing a pesticide, read, understand, and follow directions on the label. This is your most important source of information about the pesticide.

Planning Your Pesticide Program

Identify the specific pest before you select a pesticide. This may avoid unnecessary or repeated exposure to a toxic product.

Before using a newly purchased pesticide, read, understand, and follow directions on the label. The label is your most important source of information about the pesticide. Information on the label is the result of many years of research and development. If you have a choice, select the least toxic pesticide that will do the job.

Each product container must have a label giving the product name, ingredient statement, type of pesticide, storage and disposal precautions, hazard statement, EPA registration and manufacturing plant number, directions for use, net contents, and name and address of chemical company. This information should be available to your doctor or the poison control center in an emergency.

Handling and Applying Pesticides

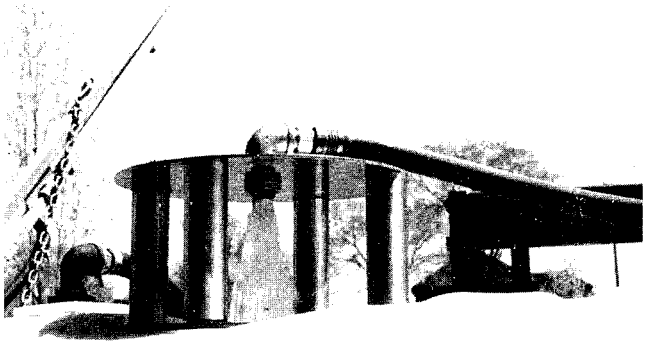
To minimize the exposure to pesticide hazards:

- Train and supervise your employees in safe use of pesticides. Periodically review their techniques, stressing potential hazards if correct work habits are not followed.
- Check the condition of the hoses and connections on the sprayer equipment frequently. Before you work on the sprayer, release the system pressure. Wear rubber gloves when doing repairs.
- When mixing pesticides inside a building, provide adequate ventilation to prevent a build-up of toxic or flammable vapors or dust. If you are mixing outside, stay upwind.

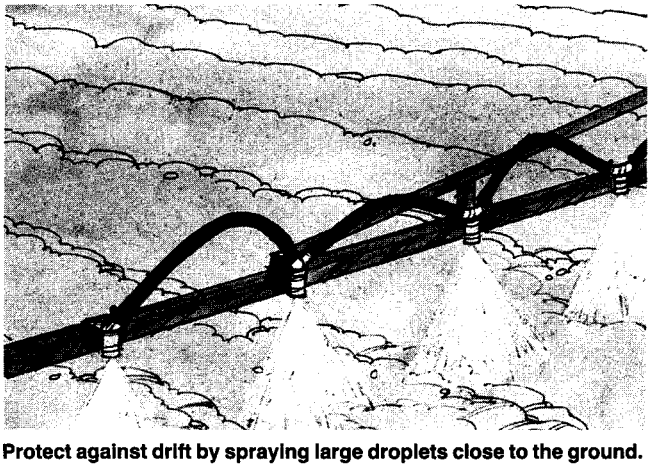
Train and supervise your employees in the safe use of pesticides.

- Avoid mixing a petroleum-based herbicide with dry ammonium nitrate as this combination can be highly flammable and explosive. Ammonium nitrate by itself is not a fire hazard. Read each label and follow instructions.

- Store pesticides in the original container with legible labels. Maintain an inventory of the stored pesticides to avoid outdated products.
- Prepare a pre-fire plan as stored pesticides are fire hazards due to the solvents used in liquid emulsion concentrates. The smoke and vapors of certain pesticides are highly toxic.
- Avoid contaminating your water supply while you mix water with the pesticide. Position the hose outlet at least six inches above the spray tank opening to provide an air gap and prevent any back siphoning. Do not drink out of any hose used for mixing pesticides.
- Protect the environment by using proper disposal procedures, avoiding accidental spills, runoff, and drift. Drift, the escaping of the chemical outside the intended area, can be controlled by using low pressure and large nozzles and by releasing pesticides close to the ground.
- Select a pesticide with a low vaporization rate. Avoid application during hot and windy periods, reducing the chance of exposure to humans, animals, and non-targeted crops.



Provide an air gap of at least six inches when adding water to the spray tank to prevent any back siphoning of pesticide into the water supply.

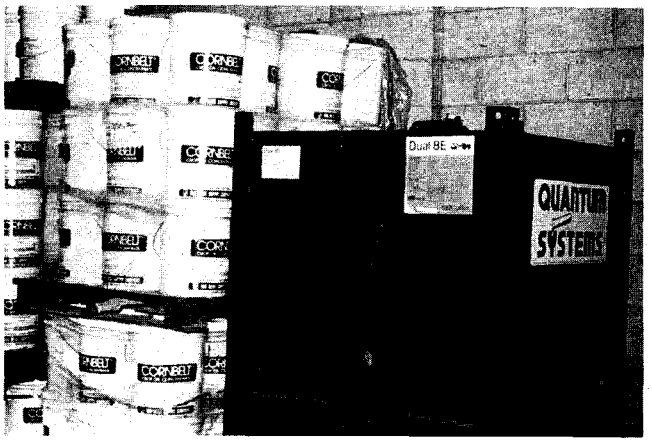


Protect against drift by spraying large droplets close to the ground.

Post fields for reentry time when using highly toxic pesticides.

Triple rinse all pesticide containers before disposal.

- Have fields on your farm, especially those under contract to food processing companies, posted for re-entry time when they are sprayed.
- When you transport pesticides in a bulk tank, label the tank properly, and use it only for that purpose. Secure the tank on the truck bed before transporting and use recommended safety procedures when transferring the chemical.
- You may need to fumigate stored grain if it is infested with insects. Fumigants typically have immense capabilities of diffusion and penetration. As the fumigant disperses the oxygen supply decreases and the poison concentration increases. The canister-type chemical respirator cannot provide oxygen and is only effective in fumigant concentrations up to two percent. To void unnecessary exposure, apply the fumigant remotely. If you cannot apply the fumigant safely, contact a professional pest control operator.



Handling pesticides in bulk tanks reduces worker exposure and labor.

Disposal of Excess Pesticides and Containers

If you need to dispose of pesticides, check the label for recommendations. Household quantities can be wrapped in paper and disposed of in a sanitary landfill. Contact your state department of agriculture for disposal procedures for larger quantities of commercial concentrate.

Handle empty containers according to recommended procedures. Triple rinse the containers by filling them at least 10 percent full with water for each rinse and pouring the water back into the spray tank. This salvages nearly all the pesticide from the container and allows the containers to be classified as nonhazardous so that they can be disposed of in sanitary landfills. Rusted or damaged containers that have been rinsed can also be disposed of at a sanitary landfill.

First Aid for Pesticide Exposure

Accidents involving pesticides occur even though precautions have been taken. Post emergency phone numbers near your phone to expedite calls to your poison control center or doctor.

Call your poison control center or doctor immediately in all cases of suspected pesticide poisoning. As there are many products on the market, have label information available. Report how the incident happened and be able to describe the symptoms of the victim. Be familiar with the poison control system in your state. Contact your local center for information regarding any poisoning that may occur. If it is necessary to make the victim vomit, the poison control center will instruct you to administer syrup of ipecac. Do not give it unless specifically instructed to do so. You can purchase a one-ounce bottle at your pharmacy.

Immediate first aid is important for pesticide exposure victims; the kind of aid required depends upon the type and extent of exposure. Start artificial respiration if the victim is not breathing. If a pulse is absent begin cardiopulmonary resuscitation. Do not attempt to give anything orally to a person who is unconscious or having convulsions.

If the skin has been exposed, remove contaminated clothing and immediately clean the contaminated body area with large amounts of soap and water. If the eyes have been exposed, flush them with water for at least 15 minutes.

Labels of highly toxic pesticides may list the symptoms of exposure. Initial symptoms may include nausea, headache, weakness, blurred vision, perspiration, convulsion, or coma. Self-diagnosis and self-treatment can be dangerous; contact your doctor if you suspect poisoning.

Summary

While pesticides can greatly increase agricultural productivity, they can also be harmful to humans, animals, and the environment if not used as directed.

The major groups of pesticides include insecticides, herbicides, rodenticides, and fungicides. Each pesticide is a chemical mixture created to control specific pests. Pesticide users should be aware of the hazards associated with these potentially toxic products.

Plan your pesticide program carefully. Purchase only the amount and kind of pesticide needed for the specific pest involved. Wear personal protective clothing and equipment when handling pesticides. Follow recommended guidelines for disposal of empty containers and outdated products. Have at least one farm worker or family member trained in emergency first aid procedures to provide assistance until medical help arrives.

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Western Agricultural Engineering Service
Agricultural Engineering Department
Oregon State University
Corvallis, OR 97331

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Minnesota Poison Control System
St. Paul-Ramsey Medical Center
640 Jackson Street
St. Paul, MN 55101

Authors: Robert A. Aherin, Extension Safety Program Specialist
Lee Schultz, Assistant Extension Safety Specialist
Richard Meronuck, Extension Plant Pathologist

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